BARNHARDT
MANUFACTURING COMPANY

BMC continues to work to identify the cause of the effluent toxicity results set out in the enclosed report.

First, in an initial effort to identify the cause of toxicity found in the treated wastewater effluent, several chronic toxicity tests were performed in December following various treatments to identify the class of contaminants contributing to the observed effluent toxicity. The treatment measures provided were:

1. Filtration with 0.45micron (µm) filter to remove colloidal materials;
2. Ethylenediaminetetraacetic acid (EDTA) treatment to chelate copper and other metals;
3. Activated carbon treatment to remove organics and other adsorbable material; and
4. Chemical coagulation to remove organics and colloidal materials.

The preliminary findings after use of these treatments did not suggest any significant improvement in acute or chronic toxicity. This indicates that carbon adsorbable organics, copper or colloidal materials are not major contributors to the observed toxicity. It is noted that the chemical oxygen demand (COD) following chemical treatment and carbon adsorption at a dosage of 2,000 milligrams per liter (mg/L) remained around 100 mg/L. Thus, a significant amount of organics remained in solution. These organics may be associated with toxicants and we are investigating the possibility that trace level toxicants may be present on the fiber as received by BMC and are not being removed from the wastewater by activated carbon.

A GC/MS scan was performed on the effluent indicating the presence of a number of aromatic organic compounds. The results obtained only provide qualitative information and the concentrations of contaminants have not been determined. However, the identified organics are being evaluated with respect to their known toxicity and further details will be developed for those compounds.

Additionally, chemicals used in BMC's manufacturing processes have been evaluated. One of the scouring agents historically used by BMC has a comparatively high concentration of aromatic compounds. BMC is planning to replace this chemical between Quarter 1 and Quarter 2 of 2020 with a suitable alternative chemical having a lower concentration of aromatic compounds. The wastewater treatment plant effluent toxicity will then be evaluated to determine if this change improves the effluent toxicity.

Another area of investigation relates to the combined effects of low hardness and high total dissolved solids (TDS) on toxicity. It has been shown that under low hardness conditions, salts, such as sodium chloride and sodium sulfate, can be toxic to macroinvertebrates such as C*eriodaphnia dubia* at relatively low concentrations. The hardness of the North River water, which is used for toxicity test dilution water, is typically around 30 mg/L and the TDS of the effluent averages around 1,500 mg/L. Thus, the low river water hardness and high wastewater salt concentrations may be contributing to the toxicity, especially at high effluent concentrations. Initial testing will be performed to determine if toxicity improves with the addition of calcium to increase the hardness. If so, the ionic constituents in the wastewater will be determined and a synthetic wastewater with similar ionic balance will be tested to confirm toxicity.

Barnhardt Manufacturing is taking proactive actions to identify the cause(s) of toxicity and steps that can be taken to obtain compliance with discharge limitations.